

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 1035 1036 1037 1038 1039 1040 1

**(43) International Publication Date**  
**22 November 2001 (22.11.2001)**

**(10) International Publication Number**  
**WO 01/87121 A2**

## PCT

**(51) International Patent Classification<sup>7</sup>:** A47C 27/08

**(21) International Application Number:** PCT/US01/15834

**(22) International Filing Date:** 17 May 2001 (17.05.2001)

**(25) Filing Language:** English

**(26) Publication Language:** English

<b>(30) Priority Data:</b>		
60/204,836	17 May 2000 (17.05.2000)	US
60/280,040	30 March 2001 (30.03.2001)	US

**(71) Applicant and**

(72) Inventor: CHAFFEE, Robert, B. [US/US]; 78 Montgomery Street, Boston, MA 02116 (US).

**(74) Agent: ANASTASI, John, N.; Wolf, Greenfield & Sacks, P.C., 600 Atlantic Avenue, Boston, MA 02210 (US).**

(81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,

CZ, DE, DĚ, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

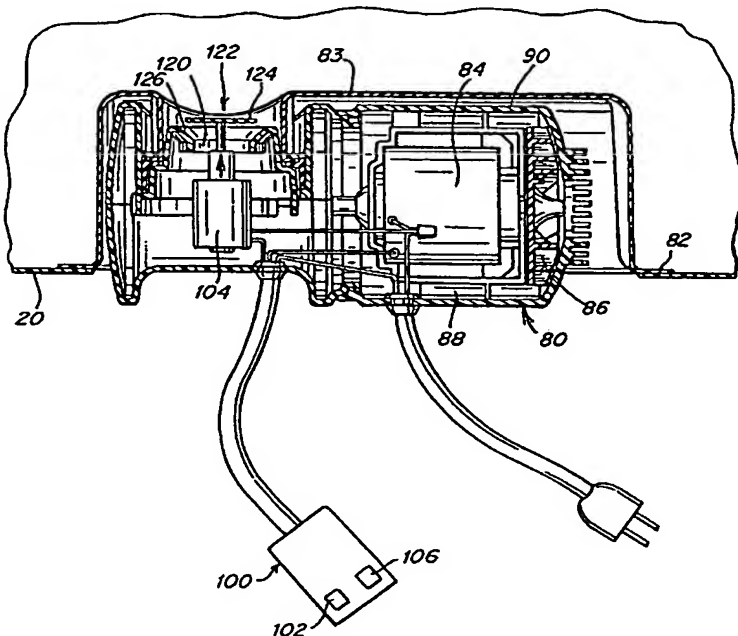
**(84) Designated States (regional):** ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

**Published:**

— without international search report and to be republished upon receipt of that report

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

**(54) Title: INFLATABLE DEVICE WITH RECESSED FLUID CONTROLLER AND MODIFIED ADJUSTMENT DEVICE**



**(57) Abstract:** The application is related to inflatable devices, and, more specifically, to an inflatable device with a recessed fluid controller and improved adjustment device. In one embodiment the application is directed to an inflatable device comprising a substantially fluid impermeable bladder and a fluid controller comprising an electrically powered pump at least partly positioned within the bladder. In another embodiment, the application is directed to a combination of a fluid controller comprising an electrically powered pump and an inflatable device. The combination comprises the fluid controller connected to the inflatable device such that the exterior profile of the fluid controller and inflated inflatable device in combination is essentially the same as the exterior profile of the inflated inflatable device. In another embodiment, the application is directed to an inflatable system comprising a substantially fluid impermeable bladder and a fluid controller comprising pump in fluid communication with the bladder. The

fluid controller further comprises a first locking mechanism and an adjustment device including a second locking mechanism sized and adapted to reversibly mate with the first locking mechanism.

**WO 01/87121 A2**

**BEST AVAILABLE COPY**

**INFLATABLE DEVICE WITH RECESSED FLUID CONTROLLER AND  
MODIFIED ADJUSTMENT DEVICE**

**Background**

5    **1. Field of the Application**

The application is related to inflatable devices, and, more specifically, to an inflatable device with a recessed fluid controller and modified adjustment device.

10   **2. Description of the Related Art**

Inflatable devices are used in a variety of contexts , such as where buoyancy or a cushioned support is needed, where space is limited or portability is desired. For example, inflatable mattresses, cushions and other body supports are used for applications such as camping, hospital bedding, and both occasional and everyday bedding in the home. Such inflatable devices have the additional advantage that the degree of inflation of the support  
15 can be adjusted to provide selective support of an irregular object, such as a person. Other examples of inflatable devices include boats, rafts and other devices for use in the water.

A variety of methods are known for providing a fluid, such as air, to inflate an inflatable device. Typically, a pump is used to supply fluid to an orifice in the inflatable device. In most instances, fluid is introduced into inflatable devices through an inlet that  
20 may be sealed to retain fluid within the inflatable device. The inlet may also serve as an outlet for deflating the inflatable device. A pump for use with an inflatable device may include a motor that drives an impeller, moving the fluid into, or out of, the inflatable device. Motorized pumps may be powered by electricity. Typically, such electricity is provided by a connection to standard house current or, where portability is desired, batteries.

25       One known inflatable device is illustrated in FIG. 1. This inflatable device is adapted for use as a mattress and includes a bladder 20 constructed to contain air in the shape of a mattress. The inflatable device also includes a fluid controller 80 connected to bladder 20 comprising a pump adapted to inflate bladder 20 when connected to household electric current. One such pump is described in U.S. Patent No. 5,267,363, herein  
30 incorporated by reference.

- 2 -

### Summary

In one embodiment, the application is directed to an inflatable device comprising a substantially fluid impermeable bladder and a fluid controller comprising an electrically powered pump at least partly positioned within the bladder.

5 In another embodiment, the application is directed to a combination of a fluid controller comprising an electrically powered pump and an inflatable device. The combination comprises the fluid controller connected to the inflatable device such that the exterior profile of the fluid controller and inflated inflatable device in combination is essentially the same as the exterior profile of the inflated inflatable device.

10 In another embodiment, the application is directed to an inflatable system comprising a substantially fluid impermeable bladder and a fluid controller comprising pump in fluid communication with the bladder. The fluid controller further comprises a first locking mechanism and an adjustment device including a second locking mechanism sized and adapted to reversibly mate with the first locking mechanism.

15

### Brief Description Of Drawings

The foregoing and other advantages of the application will be more fully appreciated with reference to the following drawings in which:

FIG. 1 is a top, plan view of a prior art inflatable device;

20 FIG. 2 is a top, plan view of an inflatable device according to one embodiment of the application;

FIG. 3 is a perspective, plan view of a fluid controller according to one embodiment of the application;

25 FIG. 4 is a perspective, plan view of a fluid controller according to another embodiment of the application;

FIG. 5 is a top, cross-sectional view of one embodiment of the application;

FIG. 6 is a side, cross-sectional view of another embodiment of the application;

FIG. 7 is a side, cross-sectional view of another embodiment of the application;

FIG. 8 is a perspective, plan view of another embodiment of the application; and

30 FIG. 9 is a perspective, plan view of another embodiment of the application.

- 3 -

### Detailed Description

The application is directed to an inflatable device with a recessed fluid controller and modified adjustment device. As used herein, a fluid controller is a device capable of regulating fluid flow and may include various components, such as a housing, valve, fluid conduit, pump, and the like. In one embodiment, the application is directed to an inflatable device including a substantially fluid impermeable bladder and a fluid controller comprising an electrically powered pump at least partly positioned within the bladder. As used herein, an object, such as a fluid controller, that is "positioned within" a bladder occupies a portion of the volume that would normally be occupied by the bladder, but need not be within the wall of the bladder. For example, a fluid controller could be located within a recess in the wall of a bladder and be "positioned within" the bladder, as this term is defined and used herein.

Referring now to the figures, and, in particular FIG. 2, one embodiment of an inflatable device according to the application will be described by way of example. The embodiment illustrated in FIG. 2 includes an inflatable device 10 having a substantially fluid impermeable bladder 20 and a fluid controller 80 comprising an electrically powered pump at least partly positioned within bladder 20.

Bladder 20 may be constructed in any manner and of any material(s) capable of retaining a desired fluid under a degree of pressure necessary for its intended application. For example, bladder 20 may be constructed of a substantially fluid impermeable barrier and may be shaped in accordance with its intended use. Where bladder 20 is intended for use as a mattress, bladder 20 may be constructed in the shape and thickness of a conventional mattress.

Bladder 20 may include internal structure, such as ribs or partitions. For example, bladder 20 may be divided into two or more separate fluid containing compartments. Bladder 20 may also include internal structure to control the movement of fluid within bladder 20. For example, bladder 20 may include baffles or walls within bladder 20 to improve the flow of fluid when bladder 20 is inflated or deflated.

A wall of bladder 20 may be any thickness required to substantially contain a fluid under pressures at which bladder 20 will be used. A thickness of the wall of bladder 20 may depend upon material from which bladder 20 is constructed. For example, more durable or elastic materials may not require the wall of bladder 20 to be as thick as less durable or elastic materials. Typically, the wall of bladder 20 may be 4-16 mils thick for polyvinyl chloride (PVC) film and polyurethane materials.

Bladder 20 may be constructed of any material or materials capable of substantially containing a fluid and forming a bladder 20 strong enough to withstand a pressure at which bladder 20 is to be used. For example, bladder 20 may be constructed of a polymeric material, such as a thermoplastic. Bladder 20 may be constructed from a relatively inexpensive, easy to work with and durable material. Some example materials include polyvinyl chloride (PVC) film and polyester. The manner of making bladder 20 may depend on its material of construction and configuration, as will be recognized by one of ordinary skill in the art.

Bladder 20 may include additional materials to improve the utility and comfort of bladder 20. For example, bladder 20 may include outer layers or coatings for durability, support or comfort. In some embodiments, bladder 20 may be coated with a material that is more pleasant to the touch than the material from which bladder 20 is constructed. Where inflatable device 10 is for use in supporting a person, bladder 20 may also include a layer to provide additional comfort, particularly where the person is to contact bladder 20. For example, bladder 20 may include a comfort layer. The comfort layer may be located on any surface of bladder 20 that may come into contact with a user of inflatable device 10. The comfort layer may improve the texture and feel of bladder 20 and, further, may allow air and moisture to pass between a person and bladder 20, preventing discomfort.

Fluid controller 80 may be constructed in any manner and using any materials that allow fluid controller 80 to control the flow of fluid into and/or out of bladder 20. In one embodiment, fluid controller 80 includes a pump that may be constructed in any manner and using any materials that allow it to inflate and/or deflate bladder 20. For example, as illustrated in FIG. 5, the pump may be a conventional fluid pump including a motor 84 that drives an impeller 86 moving air into, or out of, bladder 20. Where the pump includes motor 84, motor 84 may be powered by electricity. Electricity may be provided by a connection to standard house current or, where portability is desired, by batteries. Other types of pumps, such as diaphragm pumps, may also be used so long as they allow the pump to inflate bladder 20 to within a desired pressure range, which may include a pressure range that can be adjusted by, for example, another fluid pumping device, such as someone blowing into a conventional valve stem within the bladder, a foot pump, and the like.

Fluid controller 80 may direct fluid flow in any manner consistent with its construction. For example, where fluid controller 80 includes a pump with motor 84 and impeller 86, impeller 86 may draw fluid into, or out of, bladder 20 through a conduit 88. In some embodiments, conduit 88 may be positioned between motor 84 and a housing 90, as an

- 5 -

annulus. For example, in the embodiment illustrated in FIG. 5, fluid controller 80 includes a housing 90 that surrounds the inner workings of the pump. Housing 90 may also serve, for example, to protect the inner workings of the pump and to provide a connection between fluid controller 80 and bladder 20.

5 Preferably, where a pump is included in fluid controller 80, the pump is able to inflate bladder 20 in a relatively short time period, such as in less than a minute for an inflatable mattress. The pump may be designed to include an appropriately powerful fluid moving mechanism to achieve a desired pumping time to fill a particular inflatable device. The pump also may be small and consume as little power as possible. Low power  
10 consumption is particularly desirable where the pump is to be powered by batteries, as it may extend battery life. The pump may also be configured to be quiet in operation. A balance of pumping capacity, size, power consumption, noise generation and cost may be selected for a particular application as will be recognized by those of skill in the art.

Fluid controller 80 may be constructed of any material or materials that allow it to  
15 function as desired. Typical materials of construction of the various components of fluid controller 80 will vary with the nature of fluid controller 80 and any pump and are known to those of skill in the art.

Fluid controller 80 may be connected to bladder 20 in any manner that allows a pump to supply bladder 20 with fluid, inhibits undesired escape of fluid from bladder 20 and  
20 does not interfere with the use of bladder 20. For example, inflatable device 10 may be constructed with at least a portion of fluid controller 80 positioned within bladder 20. Where fluid controller 80 is positioned at least partially within bladder 20, fluid controller 80 will not interfere with the use of inflatable device 10. In one embodiment, the exterior profile (total volume and shape) of the fluid controller and inflated device in combination  
25 are essentially the same as the exterior profile of the inflated device absent the combination, thus reducing the opportunity for fluid controller 80 to impact or interfere with the use of inflatable device 10. For example, where fluid controller 80 is located substantially within bladder 20 in a mattress application, it allows an inflatable standard sized mattress to fit into a standard sized bed frame. Where fluid controller 80 is located within bladder 20, it may  
30 be sized such that it will not come into contact with bladder 20 when bladder 20 is inflated, except at the point(s) of connection.

Where at least a portion of fluid controller 80 is positioned within bladder 20, it may be connected to bladder 20 in any manner that will not interfere with the use of inflatable device 10 or allow undesired escape of fluid from bladder 20. For example, bladder 20 may

be adhered or sealed to a portion of fluid controller 80, such as with an adhesive or heat seal. In one embodiment, an outlet 120 (illustrated in FIG. 8) of fluid controller 80 is sealed to bladder 20.

Fluid controller 80 may include structure to facilitate connection to bladder 20. For example, fluid controller 80 may include a portion adapted to connect to bladder 20, such as a flange 82 as illustrated in FIGS. 3-5. Flange 82 may, for example, extend from housing 90 or may be a separate component connected to housing 90. As best seen in FIG. 5, flange 82 may include additional structure, such as a fluid impermeable wall 83, that may allow it to perform other functions in fluid controller 100 in addition to providing a connection point for bladder 20. Where flange 82 is connected to housing 90, it may be connected anywhere and in any manner that allows it to fluid tightly connect fluid controller 80 and bladder 20. For example, where flange 82 includes a fluid impermeable wall 83, flange 82 may be connected to housing 90 at or near outlet 120 from housing 90.

Flange 82 may be constructed of any material that allows it to durably and fluid tightly connect fluid controller 80 to bladder 20. For example, flange 82 may be constructed of a material that is more flexible than housing 90, but less flexible than bladder 20, bridging the flexibility gap between the two structures and resulting in a durable seal that may be performed, for example, by heat sealing. One example suitable material of construction of flange 82 is PVC. The thickness of flange 82 may also affect its flexibility, with thinner flanges generally being more flexible than thicker flanges. Thus the thickness of flange 82 may be selected to provide a desired flexibility with a given material.

Where flange 82 connects to housing 90 or another portion of fluid controller 80, it is preferred that such connection be reversible. For example flange 82 may snap or screw together with another portion of fluid controller 80. Additional structure may be included to promote a fluid seal between flange 82 and the remainder of fluid controller 80. For example, a seal, such as an o-ring, may be placed between flange 82 and the remainder of fluid controller 80. It is also possible to construct the inflatable device such that bladder 20 and fluid controller 80 are reversibly connected, rather than two portions of fluid controller 80 being reversibly connected. In either case, the reversible connection allows the removal of portions of fluid controller 80 for repair or replacement, preventing the entire inflatable device from having to be disposed of in the event of a failure of one component.

Bladder 20 may also include structure to facilitate the connection between bladder 20 and fluid controller 80. For example, bladder 20 may have a portion constructed to facilitate connection of fluid controller 80 to bladder 20, such as a retainer 22 as illustrated

in FIGS. 7 and 13. Retainer 22 may be constructed in any manner that will facilitate connection between bladder 20 and fluid controller 80, such as by mechanically supporting fluid controller 80. For example, retainer 22 may be constructed as a strap positioned across fluid controller 80.

5 It will now be clear that fluid controller 80 may be positioned within bladder 20 in a variety of ways. For example, fluid controller 80 may include a flange 82 that positions it at least partially within bladder 20. The size and shape of flange 82 may be selected to control the portion of pump 80 that is positioned within bladder 20. Alternatively, bladder 20 may include a recess and fluid controller 80 may be positioned within the recess and attached to  
10 bladder only at a pump outlet, or at other locations within the recess.

Fluid controller 80 may be operated by any conventional control mechanism, such as a conventional power switch. Fluid controller 80 may also include a structure for controlling fluid controller 80, such as an adjustment device 100. Adjustment device 100 may be separate or separable from fluid controller 80 to allow fluid controller 80 to be controlled remotely.  
15 In one embodiment, adjustment device 100 is a hand-held device for controlling fluid controller 80.

Adjustment device 100 may include structure for controlling the operation of fluid controller 80. For example, adjustment device 100 may include a conventional power switch 102 that energizes and de-energizes a pump within fluid controller 80. Switch 102  
20 may be any of the many well-known mechanisms for selectively connecting two conductors to supply electricity to a point of use. Switch 102 may allow the pump to be energized such that it inflates bladder 20. Adjustment device 100 may also include structure that directs the deflation of bladder 20. For example, a second switch may reverse the direction of the pump to deflate bladder 20. In some embodiments, fluid controller 80 may incorporate a  
25 valve which must be opened to allow deflation of bladder 20. In these embodiments, adjustment device 100 may also include structure to mechanically or electro-mechanically open a valve to allow deflation of bladder 20. For example, a switch 106 may act upon a mechanical opening mechanism or activate a solenoid 104 to open a valve, such as valve 122, and allow deflation of bladder 20. In one embodiment, the valve that is opened is a  
30 self-sealing valve, meaning that it is held closed, at least in part, by pressure within bladder 20. For example, a self sealing valve may include a diaphragm 124 that is urged against a valve seat 126 by fluid pressure from within bladder 20. Optionally, switch 106 may also energize the pump to withdraw fluid from bladder 20.

In one embodiment, adjustment device 100 is connectable to fluid controller 80. In this embodiment, adjustment device 100 may be connected to fluid controller 80 at a conveniently located position such that it is easily found, particularly when inflatable device 10 is in use. For example, where inflatable device 10 is a bed, fluid controller 80 may be located at the head of the bed such that adjustment device 100 may be connected thereto for easy access when the bed is in use. Any control elements on adjustment device 100, such as switches 102, 106 or a button 108 may be located on adjustment device 100 for easy access. For example, the control elements may be located on a top portion of adjustment device 100, as illustrated in FIG. 4. Attachment of adjustment device 100 to fluid controller 80 may also facilitate deflation of bladder 20 with adjustment device 100. For example, where a valve must be opened to deflate bladder 20, adjustment device 100 may be in mechanical communication with fluid controller 80 to disengage the valve. In one embodiment, a button 108 on adjustment device 100 may be in mechanical communication with fluid controller 80 to open a valve.

The connection between adjustment device 100 and fluid controller 80 may be secure. For example, in one embodiment, adjustment device 100 reversibly locks to fluid controller 80. Where adjustment device 100 locks to fluid controller 80, adjustment device 100 and fluid controller 80 may include mating locking mechanisms 110, 112. Locking mechanisms 110 and 112 may be constructed in any manner and using any material(s) that allow locking mechanisms 110, 112 to reversibly lock together. By "lock" it is meant that two mechanisms fit together in such a way that a force must be overcome to separate them. In one embodiment, one locking mechanism 110 includes one or more spring latches 114 that mate with impressions 116 in other locking mechanism 112. Either locking mechanism 110, 112 may be located on either of adjustment device 100 or fluid controller 80.

Having thus described certain embodiments of the inflatable device of the application, various alterations, modifications and improvements will be apparent to those of ordinary skill in the art. Such alterations, variations and improvements are intended to be within the spirit and scope of the application. Accordingly, the foregoing description is by way of example and is not intended to be limiting. The application is limited only as defined in the following claims and the equivalents thereto.

What is claimed is:

Claims

1. An inflatable device, comprising:  
a substantially fluid impermeable bladder; and  
5 a fluid controller comprising an electrically powered pump and at least partly positioned within the bladder.
2. The inflatable device of claim 1, wherein the fluid controller is constructed and arranged such that a majority of the fluid controller is positioned within the bladder.  
10
3. The inflatable device of claim 2, wherein the fluid controller is constructed and arranged such that substantially all of the fluid controller is positioned within the bladder.
4. The inflatable device of claim 1, wherein the bladder comprises a recess sized to  
15 accommodate at least a portion of the fluid controller.
5. The inflatable device of claim 1, wherein the fluid controller comprises a housing.
6. The inflatable device of claim 5, wherein the housing comprises a flange that  
20 connects to the bladder.
7. The inflatable device of claim 1, wherein the fluid controller comprises a flange that connects to the bladder.
- 25 8. The inflatable device of claim 7, wherein the flange comprises a fluid impermeable wall that connects to a housing of the inflatable device.
9. The inflatable device of claim 8, wherein the flange connects to the housing at an outlet of the housing.  
30
10. The inflatable device of claim 7, wherein a remainder of the fluid controller is constructed and arranged to be removable from the flange.

- 10 -

11. The inflatable device of claim 1, wherein the fluid controller comprises a first locking mechanism and an adjustment device including a second locking mechanism sized and adapted to reversibly mate with the first locking mechanism.
- 5 12. The inflatable device of claim 11, wherein the adjustment device further comprises:  
a first switch electrically connected to the pump and a power source such that the first switch may selectively energize the pump; and  
a second switch mechanically connected to a valve of the fluid controller such that it may selectively open the valve;  
10 wherein the first switch and second switch are in fixed proximity to one another.
13. The inflatable device of claim 12, wherein the adjustment device further comprises a top portion and the first switch and the second switch are positioned on the top portion.
- 15 14. The inflatable device of claim 1, further comprising an adjustment device, including:  
a first switch electrically connected to the pump and a power source such that the first switch may selectively energize the pump; and  
a second switch electrically connected to a power source and electro-mechanically connected to a valve of the fluid controller such that it may selectively open the valve.  
20
15. The inflatable device of claim 14, wherein the electro-mechanical connection comprises a solenoid.
16. The inflatable device of claim 1, wherein the fluid controller comprises a valve and a  
25 member connected to the valve that moves the valve between an open and a closed position.
17. The inflatable device of claim 16, wherein the member is adapted to be actuated by a switch on an adjustment device.
- 30 18. The inflatable device of claim 16, wherein the member is a stem.
19. A combination of a fluid controller comprising an electrically powered pump and an inflatable device, comprising:  
the fluid controller connected to the inflatable device such that the exterior profile of

- 11 -

the fluid controller and inflatable device in combination is essentially the same as the exterior profile of the inflatable device.

20. An inflatable system, comprising:  
5 a substantially fluid impermeable bladder; and  
a fluid controller comprising:  
a pump in fluid communication with the bladder and comprising a first  
locking mechanism; and  
an adjustment device including a second locking mechanism sized and  
10 adapted to reversibly mate with the first locking mechanism.
21. The inflatable system of claim 20, wherein the adjustment device further comprises:  
a top portion;  
a first switch having a first position and a second position, positioned on the top  
15 portion and electrically connected to the pump and a power source; and  
a second switch positioned on the top portion and mechanically connected to a valve.
22. The inflatable system of claim 20, wherein the pump is an electrically powered  
pump and the fluid controller is at least partly positioned within the bladder.  
20
23. The inflatable system of claim 22, wherein a majority of the fluid controller is  
positioned within the bladder.
24. The inflatable system of claim 23, wherein substantially all of the fluid controller is  
25 positioned within the bladder.
25. The inflatable system of claim 22 wherein the bladder includes a recess sized and  
configured to accommodate at least a portion of the pump.
- 30 26. The inflatable system of claim 22, wherein the pump includes a housing and the  
housing includes a flange that connects to the bladder.
27. An inflatable device, comprising:  
a substantially fluid impermeable bladder; and

- 12 -

a fluid controller comprising:

an electrically powered pump,

a self-sealing valve, and

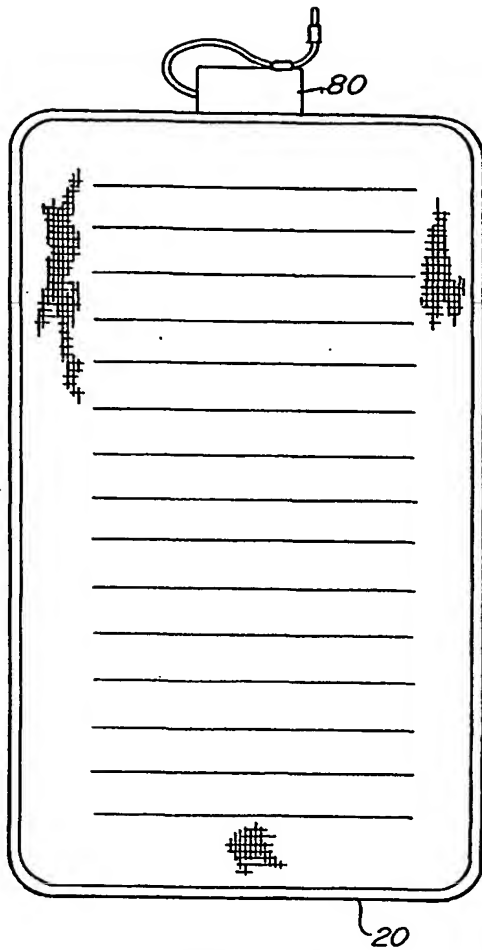
an adjustment device, comprising:

5           a first switch electrically connected to the pump and a power source  
such that the first switch may selectively energize the pump, and

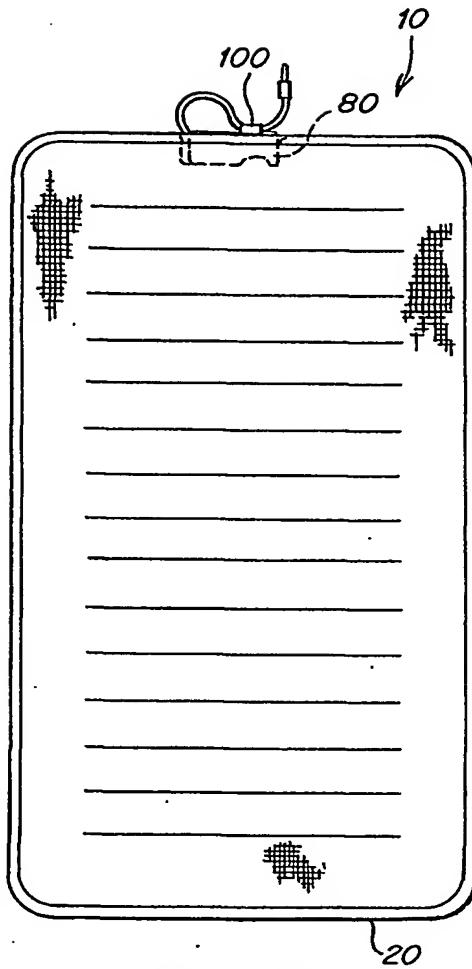
          a second switch electrically connected to a power source and electro-  
mechanically connected to a valve of the fluid controller such that it may  
selectively open the valve.

10

28.   The inflatable device of claim 17, wherein the electro-mechanical connection  
comprises a solenoid.

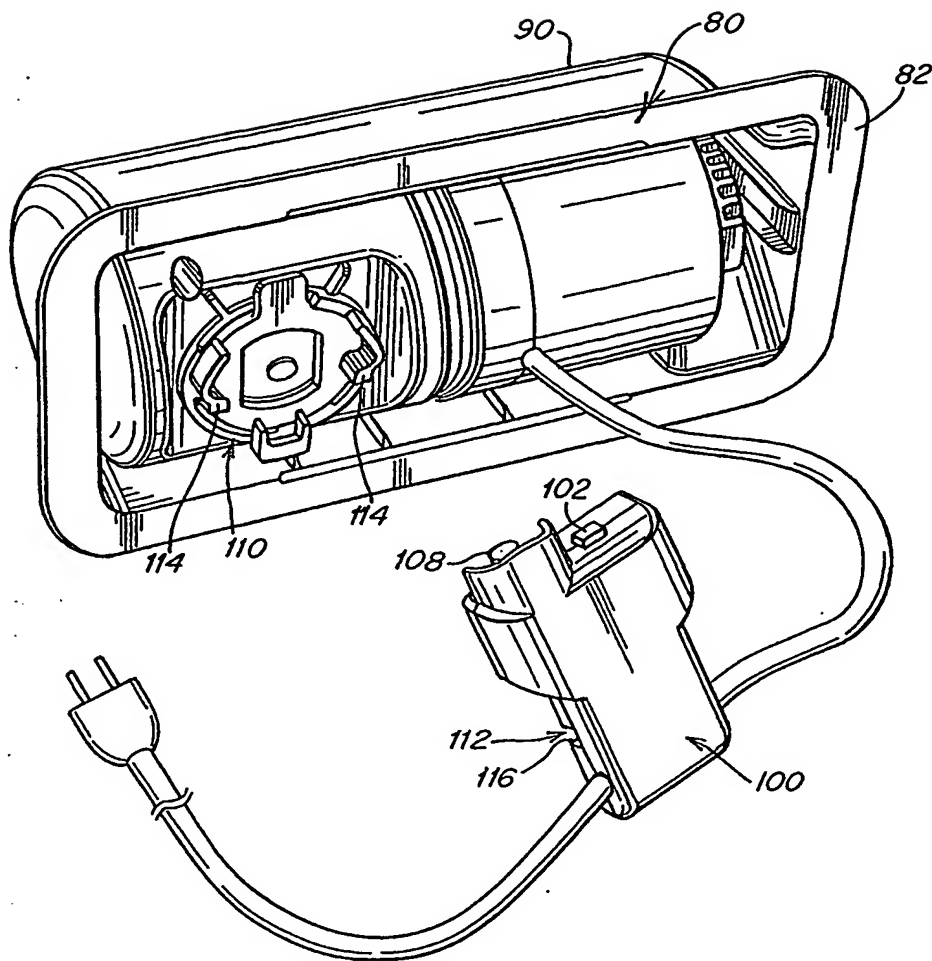


*Fig. 1*  
(PRIOR ART)

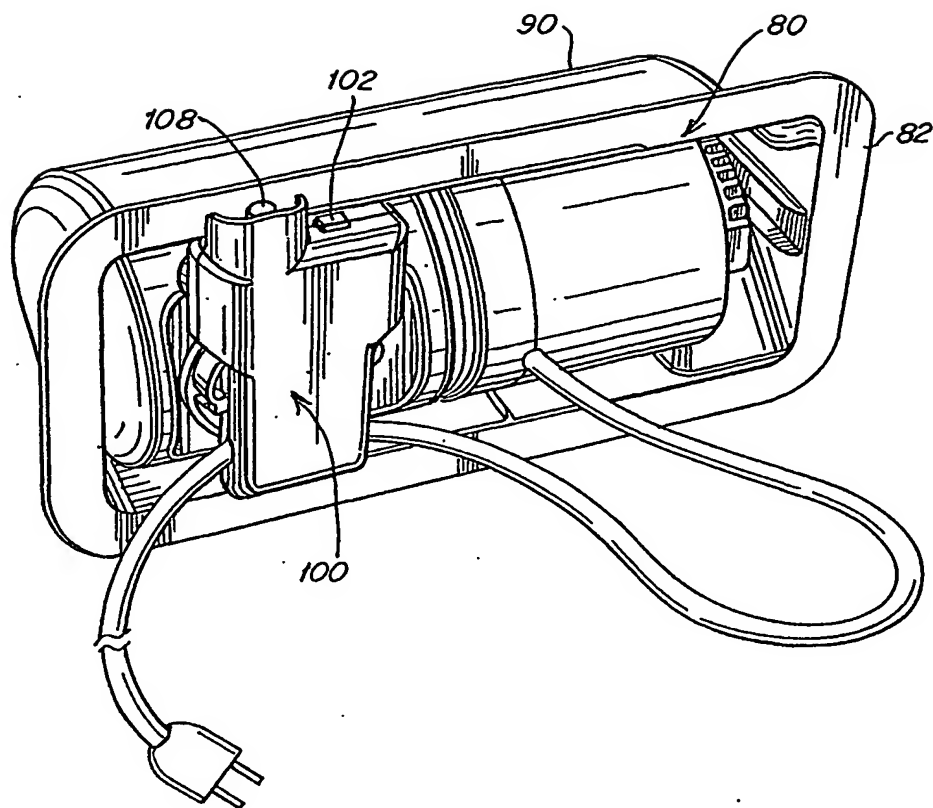


*Fig. 2*

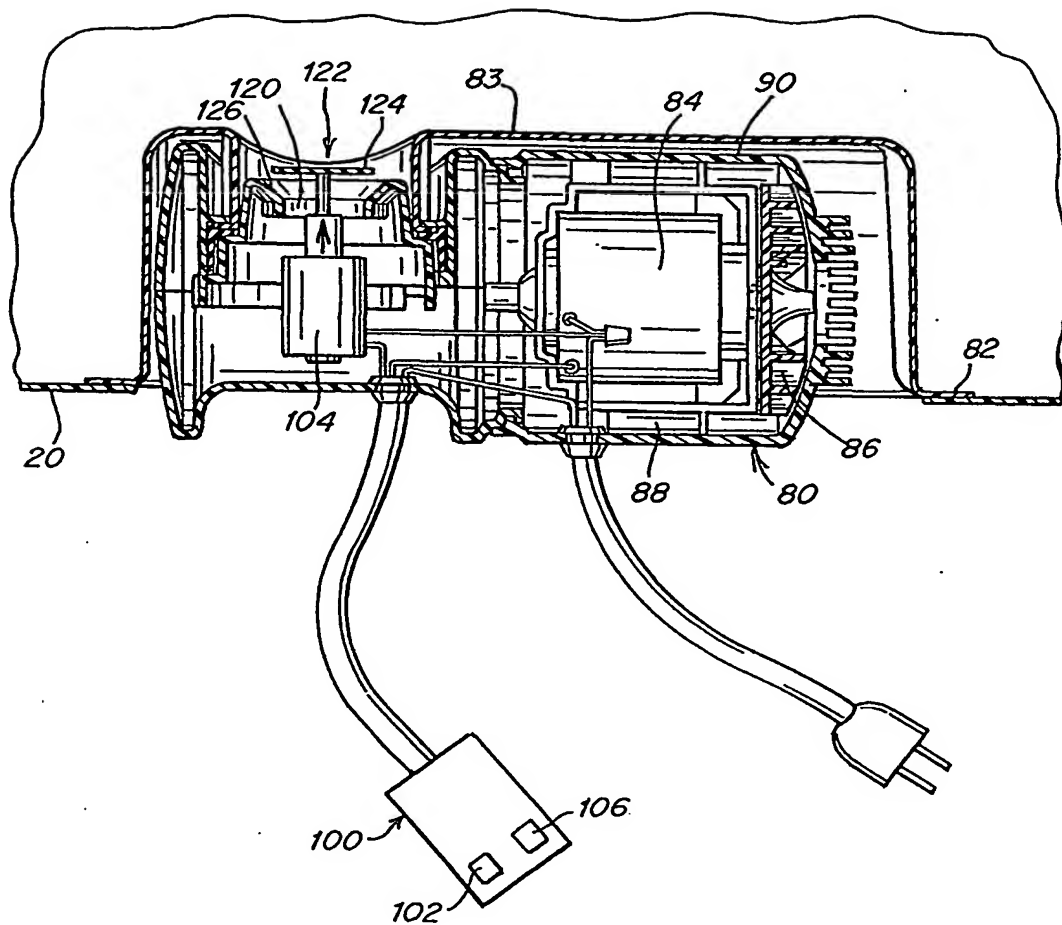
2/6



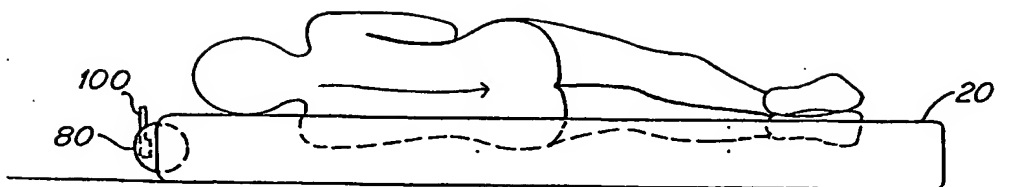
*Fig. 3*



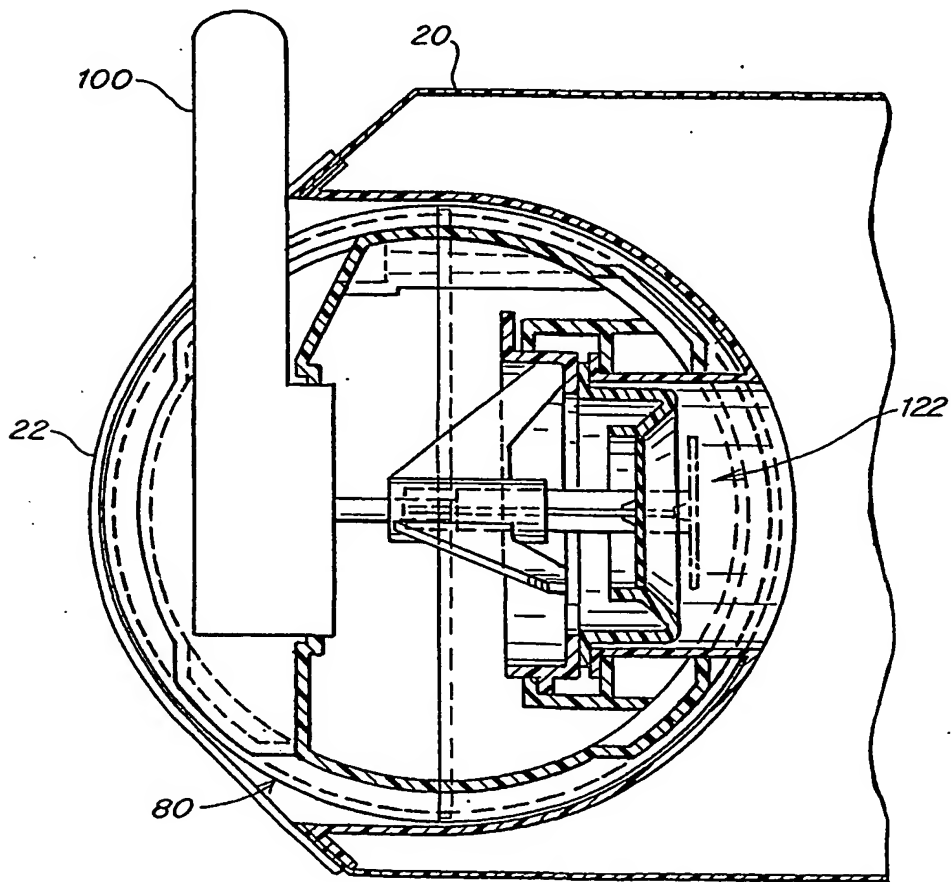
*Fig. 4*

*Fig. 5*

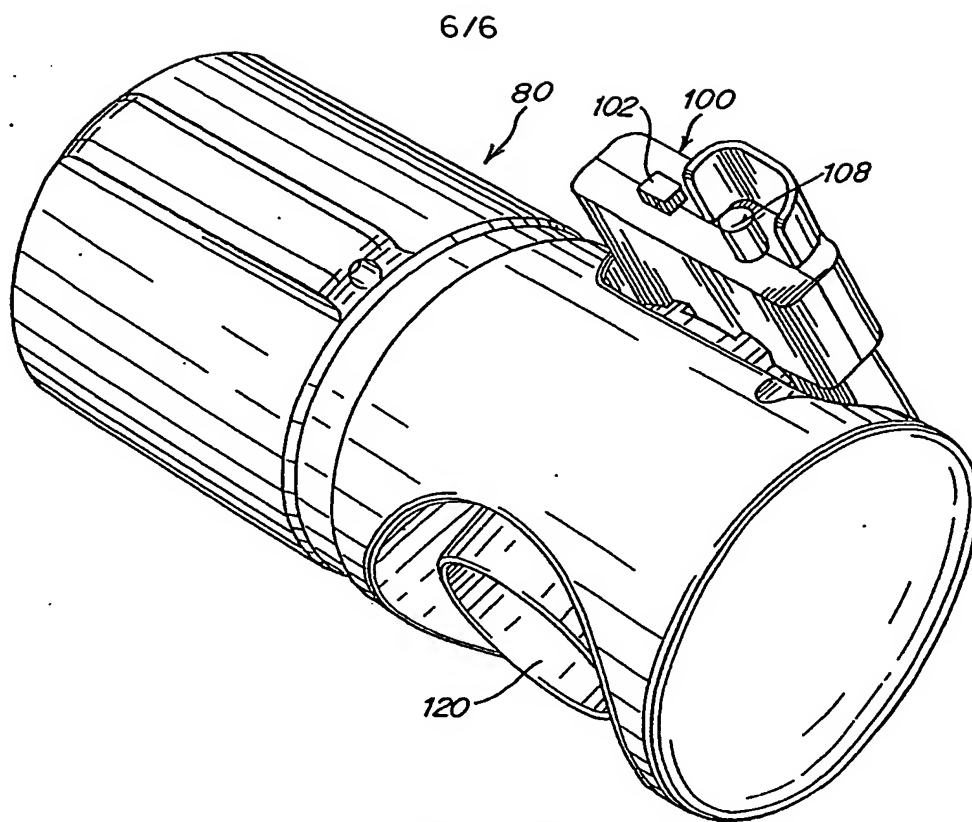
5/6



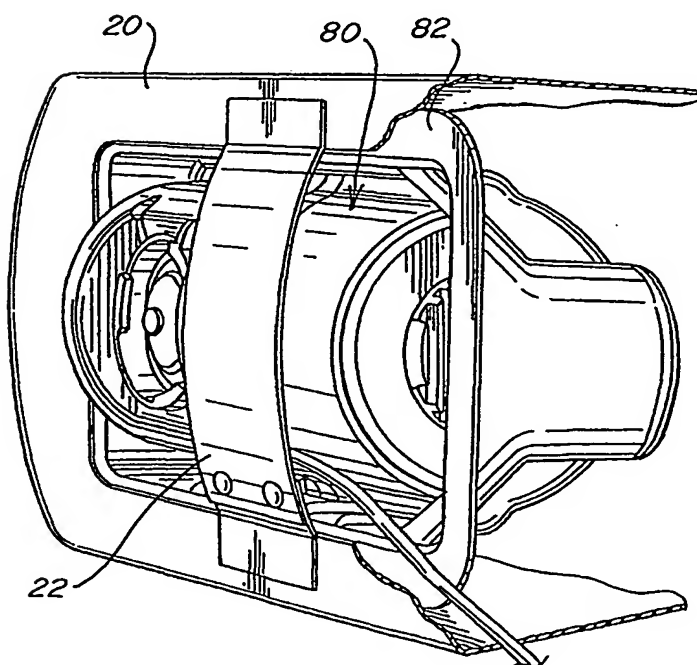
*Fig. 6*



*Fig. 7*



*Fig. 8*



*Fig. 9*

**This Page is Inserted by IFW Indexing and Scanning  
Operations and is not part of the Official Record**

**BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☒ FADED TEXT OR DRAWING
- ☐ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☐ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: \_\_\_\_\_

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.**